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INFORMATION PORTAL

FIELD OF INVENTION

This invention relates to communication systems, and in particular, to wireless communication systems.

RELATED APPLICATIONS

This application claims the benefit of the priority date of U.S. provisional application 60/199,528, filed on April 25, 2000, the contents of which are herein incorporated by reference.

BACKGROUND

Mobile processing-systems, such as portable computers and personal digital assistants, are often provided with the ability to establish wireless connections with other processing systems. Such wireless connections enable a user to access internet sites while traveling. A user thus equipped is able to obtain real-time information from an internet site and to act immediately on the basis of that information. For example, a user on the way to the airport may use a mobile processing-system to discover that a flight has been cancelled and that it may be preferable to simply turn around and go home.

As a practical matter, however, it is difficult for a user of a mobile processing-system to conveniently acquire timely information while traveling. The process of identifying and accessing a web site can be cumbersome and difficult to attend to while coping with the exigencies of travel. In addition, the speed of wireless data transmission is itself limited by numerous physical constraints. For example, high-speed data transmission requires high bandwidth. Such bandwidth may not be available simply because a finite spectrum must be shared by many channels. Inadequate signal-to-noise ratio, resulting from noise or multi-path reflections, can result in high error rates, which in turn require frequent retransmission of data packets.

SUMMARY

A system according to the invention provides high-speed wireless communication to a mobile processing system. The system maintains one or more information portals that provide high-speed wireless access to a local area network. Because of the limited spatial extent of an information portal, a low-power but high-bandwidth channel can be maintained within the information portal. Within the limited spatial extent of the information portal, wireless data communication is established at rates much higher than those available in those wireless data communication systems that provide wireless data communication over public airwaves.

A communication system incorporating the invention includes a stationary transceiver defining an information portal in its immediate vicinity. A local server in communication with this stationary transceiver is configured to respond to a mobile processing-system present within the information portal.

Typically, the local server is configured to perform a function on the basis of the identity of the mobile processing-system. This function might be to provide selected data to the mobile processing-system, to provide interactive access to a computer network, or to perform various functions associated with the operation of a building that houses the stationary transceiver. Examples of such functions include permitting building access to a portion of the building, or controlling an elevator in the building.

In one aspect of the invention, the local server is configured to establish a communication link between the mobile processing-system in the information portal and a selected location. The communication link can be an audio link, a video link, or a two-way communication link.

Various types of transceivers can be used as stationary transceivers. For example, the stationary transceiver can be a radio transceiver, an optical transceiver, an infrared transceiver, and an acoustic transceiver.

Information is communicated to the mobile processing system when the mobile processing system is within an information portal. Consequently, the stationary transceiver, and hence the information portal that it maintains, is deployed at locations in which commuters or travelers are expected to linger momentarily. Such locations include elevators, elevator lobbies, waiting areas at transportation nodes, for example train platforms at train stations, airplane gate areas at airports, and even the transportation vehicles themselves.

In another embodiment, the communication system also includes a fulfillment server in communication with the local server. The fulfillment server has access to a wide area network. The wide area network can be a global computer network, such as the internet.

The fulfillment server can include a user-interface to enable a user to specify certain actions. Examples of such actions include making selected information available for transmission to a mobile processing system at an information portal, or requesting that the fulfillment server send, to the mobile processing system, a message indicating the occurrence of a selected event.

In one aspect of the invention, the fulfillment server is configured to provide interactive services to the mobile processing system while the mobile processing system is in an information portal. Examples of such interactive services include email or internet access.

To enhance performance, it is useful to provide a cache at the local server. Such a cache is used to accumulate information intended to be transmitted to a mobile processing system. This information remains in cache until the mobile processing system enters an information portal. Once the mobile processing system for which the accumulated information is intended enters an information portal, the information in cache is relayed to the mobile processing system.

In another embodiment, the communication system includes a plurality of stationary transceivers, each configured for wireless communication with a mobile processing system present in a corresponding information portal; and a server system in communication with each of the stationary receivers. The server system has a link to a global computer network. This enables the server system to provide the mobile processing system with wireless access to the global computer network.

The invention also includes a method for providing a mobile processing system with wireless access to a global computer network. The method includes maintaining an information portal and establishing wireless communication between the mobile processing system and a server system following entry of the mobile processing system into the information portal. Once communication has thus been established, a link between the server system and the global computer network is provided.

Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. Although methods and systems similar or equivalent to those described herein can be used in the practice or testing of the present invention, suitable methods and systems are described below. All publications, patent applications, patents and other references mentioned herein are incorporated by reference in their entirety. In case of conflict, the present specification, including definitions, will control. In addition, the systems, methods, and examples are illustrative only and not intended to be limiting.

Other features and advantages of the invention will be apparent from the claims and from the following detailed description and its accompanying figures.

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 is a communication system incorporating the invention.

FIG. 2 illustrates an application of the communication system of FIG. 1; and

FIGS. 3 and 4 show additional communication systems incorporating the invention.

DETAILED DESCRIPTION

Referring to FIG. 1, a communication system **10** incorporating the invention includes a local server **12** in data communication with one or more stationary transceivers **14a-n** across a private network. Each stationary transceiver **14a-n** maintains a corresponding information portal **16a-n** extending around a vicinity thereof. When a person carrying a mobile processing-system **18**, for example a portable computer or a portable digital-assistant, enters one of these information portals **16a**, the stationary transceiver **14a** maintaining that information portal **16a** establishes wireless communication between the local server **12** and the mobile processing-system **18**.

The mobile processing-system **18** and the stationary transceiver **14a** can establish wireless communication by transmitting and receiving electromagnetic waves or acoustic waves modulated by data. In the case of electromagnetic waves, the waves can be radio-frequency waves, infrared waves, optical waves, or electromagnetic waves having any other frequency suitable for short-range data-communication. Acoustic waves are typically ultrasonic or mega sonic waves.

In the case of radio-frequency waves, the establishment of the communication link can be completely passive, with no action required of the person other than entry into the information portal **16a**. In the case of infrared or optical waves, or other waves having wavelengths much shorter than nearby scattering structures, the person establishes communication by pointing a port on the mobile processing-system **18** toward the stationary transceiver **14a**.

The stationary transceivers **14a-n** can be deployed within a building in conjunction with elevator displays and lobby displays as described in pending U.S. applications 09/123,284 and 09/465,504, the contents of which are incorporated by reference. This deployment is advantageous because the display can then be used to communicate information to the person carrying the mobile processing-system **18**. In addition, the display is already in data communication with the local server **12** and can therefore be easily modified to accommodate the stationary transceiver **14a**. However, stand-alone stationary transceivers **14a-n** can also be deployed at various locations without the presence of a nearby display.

Stationary transceivers **14a-n** are typically deployed at locations in which commuters and other travelers are likely to linger in the course of their travel. This ensures that the person is in an information data portal **16a-n** long enough for meaningful data transmission to occur.

The local server **12** is also connected to one or more peripheral devices **20**. Such peripheral devices can include elevator control system **22**, building security systems **24**, building communication systems **26**, building environmental-control-systems **28**, and other systems that govern additional aspects of building functionality. These connections enable the local server **12** to control building functions in response to the identity and movement of a person carrying a mobile processing-system.

A local area network **30** links the local server **12**, the peripheral devices, and the stationary transceivers **14a-n**. These links can be wired links, wireless links, or a mixture of both wired and wireless links.

In operation, a person carrying a mobile processing-system **18** enters one of the information portals **16a-n**. The mobile processing-system **18** and the stationary transceiver **14a** then establish communication, thereby providing a data path between the local server **12** and the mobile processing-system **18**. This enables the local server **12** to identify the mobile processing-system **18**. The local server **12** can then interact with the peripheral devices in a manner consistent with the identity of the mobile processing-system **18**.

To illustrate examples of some of the various types of interaction that are possible, it is instructive to follow the activities of a typical building tenant upon arrival at the building. FIG. 2 illustrates the progress of a tenant who, at time t_1, enters a parking lot **32** adjacent to a building **34**.

Throughout this detailed description, reference is occasionally made to a tenant or user as having been detected and identified while within an information portal **16a-n**. It is understood, however, that it is the mobile processing-system **18**, and not the tenant or user, that is in fact being detected and identified.

Referring now to FIG. 2, a first stationary transceiver **36a** maintains a first information portal **38a** at the entrance to the parking lot **32**. As the tenant drives through this first information portal **38a**, the local server **12** identifies the mobile processing-system **18** and notes a time-of-entry to be used later for calculating an appropriate parking fee.

After a few minutes, the tenant parks and begins to walk toward a nearby elevator lobby **40**. At time t_2, as the tenant approaches the elevator lobby **40**, he enters a second information portal **38b**

maintained by a second stationary transceiver **36b**. When the tenant enters this second information portal **38b**, the second stationary transceiver **36b** establishes communication between the local server **12** and the tenant's mobile processing-system **18**. The local server **12** records the floor on which the tenant has parked. This data is later retrieved and used to program the elevator when the tenant re-enters an elevator at the end of the day. The local server **12** then interacts with the elevator control system **22** to call an elevator **42**. By the time the tenant reaches the elevator lobby **40**, the elevator **42** is already well on its way to meeting him.

The local server **12** also determines the floor that the tenant works on and, in a further interaction with the elevator control system **22**, instructs the elevator **42** to proceed to that floor once the tenant enters a third information portal **38c** maintained by a third stationary-transceiver **36c** within the elevator **42**. The local server **12** then interacts with the building environmental-control-systems **28** to turn on heat or air-conditioning at locations selected on the basis of the tenant's identity.

When the elevator **42** arrives to pick up the tenant at the designated floor of the parking garage, the local server **12** starts a timer. If the tenant fails to enter the third information portal **38c** (located in the elevator **42**) within a selected time, the local server **12** sends a message to building security personnel alerting them to the possibility of a mishap.

At time t_3, the tenant enters the third information portal **38c** by boarding the elevator **42**. The third stationary-transceiver **36c** in the elevator **42** detects the tenant's entry into the third information portal **38c**. Without further intervention from the tenant, the elevator **42** then carries the tenant to the floor selected by the local server **12**.

After a few moments, the elevator reaches the selected floor **42**, whereupon the tenant exits the elevator **42**. At time t_4, the tenant enters a fourth information portal **38d** maintained by a fourth stationary transceiver **38d**. The local server **12** detects the tenant's entry into the fourth information portal **38d** and sends an appropriate message to the building security system **24**. In response, the building security system **24** unlocks an appropriate door **44** for the tenant.

In the unlikely event that the elevator **42** becomes stuck between floors, the elevator control system **22** detects the existence of this condition and signals the local server **12**. The local server **12** then checks to see if there are any occupants within the information portal maintained in the elevator **42**. If there are such occupants, the local server **12** uses the information portal maintained in the elevator **42** to provide a real-time communication link between the occupants and building security

personnel. The communication link can be a streaming video or audio link. Preferably, the communication link thus established is a two-way video link.

The communication system **10** can also be used to broadcast announcements and other data directly to the mobile processing-system **18**. In such a case, a tenant enters any one of several information portals scattered throughout the building **34** while carrying a mobile processing-system **18**. Upon entry into any such information portal, the local server transmits appropriate data to the mobile processing-system **18**.

Another embodiment, shown in FIG. 3, also includes a fulfillment server **46** that interfaces the local server **12** with selected content providers **50a-c** across a global computer network **52.** The fulfillment server **46** communicates with the local server **12** over a private network **48** or a virtual private network. Data transport over the private network **48** can be carried out using a frame relay or xDSL service.

The addition of the fulfillment server **46** to the communication system permits the local server to relay information gathered by the fulfillment server **46** to a user whenever that user enters one of many information portals dispersed throughout a building **34**. A user-interface **54** associated with the fulfillment server **46** enables a user to request delivery of selected information from the content providers to the user's mobile processing-system **18**.

To illustrate the types of services that can be provided, it is useful to consider a user who wants to obtain a traffic report at the end of every working day. The activities of such a user are illustrated in FIG. 3.

At time t_1, the user accesses the user-interface **54** of the fulfillment server **46** using a web-browser **56** executing on the user's computer system **58**. Through this user-interface **54**, the user instructs the fulfillment server **46** to routinely make a traffic report available everyday.

At an appropriate time, and without further intervention by the user, the fulfillment server **46** retrieves traffic information from a content provider **50a**. The fulfillment server **46** then identifies the local server **12** associated with that particular user. After doing so, the fulfillment server **46** sends the requested information to that local server **12**. The local server **12** then stores that information in a cache **60** for delivery to the user's mobile processing-system **18** upon entry of that system into an information portal **16a-n**.

At time t_2, while the user is in the elevator **42**, the user enters or passes through an information portal while carrying the mobile processing-system **18**. The stationary transceiver **14a**

maintaining that information portal sends a message to the local server **12** indicating the presence of the user's mobile processing-system **18**. In response, the local server **12** retrieves the requested information from cache and sends it to the stationary transceiver **14a**. The stationary transceiver **14a** then transmits that data directly to the mobile processing-system **18**. In this way, by the time the user leaves the information portal **16a**, the mobile processing-system **18** will have collected the desired data.

The foregoing example illustrates the manner in which the communication system **10** provides programmed services. Such programmed services are characterized by a request that particular content be made available for delivery during a particular time interval. However, the communication system **10** can also provide real-time services. Real-time services are characterized by the delivery of a message indicating that a particular event has occurred.

To illustrate the use of the communication system **10** in providing real-time service, consider a user who wants to be alerted when, for example, a price of a particular stock has risen above a pre-determined level. The user would then access the user-interface **54** of the fulfillment server **46** using a web-browser **56** executing on the user's computer system **58**. Upon doing so, the user could then request that the share price of a stock be monitored and that a message be sent if the share price reaches or exceeds the pre-determined level.

In response to the user's instruction, the fulfillment server **46** periodically accesses one or more of the selected content providers **50a-50c** throughout the day to monitor the price of the stock. If the price exceeds the pre-determined threshold, the monitor sends a message to the local server **12** associated with the user. The local server **12** then caches this message for subsequent delivery to the user whenever the user enters an information portal **16a-n** while carrying a mobile processing-system **18**.

When the user carries the mobile processing-system **18** into an information portal **16a**, the local server **12** detects the presence of the mobile processing-system **18**, retrieves the message from cache, if any, and transmits it to the mobile processing-system **18**.

A communication system **10** as described herein can also provide interactive services to a user. For example, the local server **12** can provide information such as locations of nearby restaurants, automated teller machines, train stations, and other services. Such a service is useful for travelers who are unfamiliar with the immediate neighborhood. In this case, the user need not interact with a fulfillment server **46** beforehand. Such information can be available upon request whenever a user carrying a mobile processing-system **18** enters an information portal **16a**.

Although the foregoing description teaches a communication system **10** installed in a building, such as an office building or a hotel, similar communication systems can be installed virtually anywhere that a person carrying a mobile processing-system **18** can be expected to linger momentarily. For example, communication systems of the type described herein can also be installed at such diverse locations as airports, train stations, train cars, and cruise ships.

A user of the communication system **10** need not be confined to a particular local server **12**. For example, a communication system **10** can be installed to encompass a set of train stations, each of which has its own local server **12**, as shown in FIG. 4.

In this application, each train station (of which only two are shown in the figure) includes a local server **12a-b** having a local cache **60a-b**. The first local server **12a** provides a link between four stationary transceivers **14a-d** at a first train station and a fulfillment server **46**. The second local server **12b** provides a link between four additional stationary transceivers **14e-h** at a second train station and the fulfillment server **46**. The fulfillment server **52** provides a link to a plurality of content providers **50a-c** across a global computer network **52**. It is understood that the number of stationary transceivers in each train station and the number of train stations can be varied without departing from the scope of the invention.

When a local server **12a** detects the user at the train station or entering the train, a link is established in the manner already described in connection with FIGS. 1 and 3. would be delivered as already described above. For interactive services, such as email, or for extended services, such as music, the local server **12** would accept the request, cache it, and wait for the next train station to complete the request. The user would then be notified when the information becomes available.

It is to be understood that while the invention has been described in conjunction with the detailed description thereof, the foregoing description is intended to illustrate and not limit the scope of the invention, which is defined by the scope of the appended claims. Other aspects, advantages, and modifications are within the scope of the following claims.

What I claim as new, and secured by letters patent is: